PATENT ABSTRACTS OF JAPAN

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(11)Publication number : 06-182626
(43)Date of publication of application : 05.07.1994

(51)Int.CI. B23H 9/00
B23H 1/06

(21)Application number : 04-336944
(22)Date of filing : 17.12.1992

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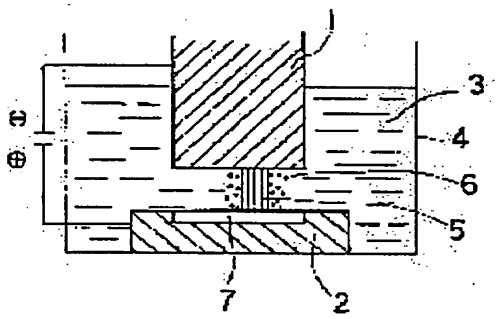
(54) HIGH CORROSION RESISTING SURFACE FINISHING METHOD

(57)Abstract:
PURPOSE: To provide a high corrosion resisting surface finishing method, by which a surface condition adjusting processing and formation of a discharge machining alloy layer can be performed simultaneously, taking an element having good corrosion resistance, an alloy having the element or a conductive ceramics as an electrode using a discharge machining method in order to improve the corrosion resistance and stress corrosion cracking resistance.
CONSTITUTION: The surface of a member 2 to be processed formed by an iron (Fe) base alloy such as a carbon steel, a low-alloy steel, an austenitic stainless steel or a ferritic stainless steel, a nickel(Ni) base alloy or a cobalt(Co) base alloy is discharge-machined in oil 3 or water 3 using an electrode 1 having at least one high corrosion resisting element to remove the initial surface of the member and form an electric discharge machining alloy layer 7 excellent in corrosion resistance on the surface.



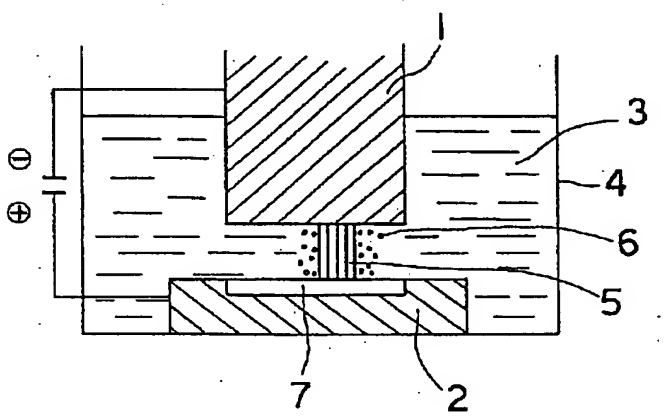
[JP,06-182626,A(1994)]

Japanese (PDF) | File Wrapper Information

CLAIM + DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

Drawing selection Representative drawing



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CLAIMS

[Claim(s)]

[Claim 1] (Iron Fe) radical alloys, such as carbon steel, low alloy steel, austenitic stainless steel, or ferritic stainless steel, [the surface of the structure which consists of said member which receives the structure in a light water reactor or neutron irradiation of the member which consists of a (Nickel nickel) radical alloy or a cobalt (Co) radical alloy] The high-corrosion-resistance surface treatment method which carries out electron discharge method processing and is characterized by forming the electron discharge method alloy layer excellent in corrosion resistance in clearance on the surface of initial of said member, and this surface in the inside of an oil, or underwater using the electrode which has a high-corrosion-resistance element.

[Claim 2] The high-corrosion-resistance surface treatment method characterized by being the part which receives weld zones, such as neutron flux Measurement Division housing, a shroud, shroud support, a top guide, and the reactor core support plate surface, a heat affected zone, or neutron irradiation as the structure in said light water reactor furnace in Claim 1.

[Claim 3] In Claim 1 or 2, as an electrode which has a high-corrosion-resistance element, chromium (Cr), Using the metal which consists of any one or two components or more among nickel (nickel), iron (Fe), titanium (Ti), niobium (Nb), and a tantalum (Ta), or the alloy having contained them, as an electron discharge method alloy layer Cr, nickel, the high-corrosion-resistance surface treatment method characterized by forming the alloy layer which contains any one or two components or more among Fe, Ti, Nb, and Ta.

[Claim 4] The high-corrosion-resistance surface treatment method characterized by forming the alloy layer of the range of 5-500 micrometers in the surface of the member for processed as thickness of an electron discharge method alloy layer in either of the Claims 1-3.

[Claim 5] When said member is austenitic stainless steel in Claim 3, It is the range Cr and whose Ni concentration are 0.85 to 1.3 times each concentration of a base material by weight on the surface. And the high-corrosion-resistance surface treatment method

characterized by containing those compounds and 2% or less of dissolution Ti and Nb, or Ta which fixed carbon, oxygen, and the nitrogen atom in working liquid by Ti, Nb, or Ta, and forming the electron discharge method alloy layer of the 5-500-micrometer-thick range.
[Claim 6] In the case of the ferritic stainless steel with which said member contains 12 to 18%, and nickel for Cr 2% or less by weight in Claim 3 The range whose Cr concentration is 0.83 to 1.3 times the concentration of a base material by weight on the surface, or [in addition to the Cr concentration / Ni concentration is 8% or more of range, and] Those compounds and 2% or less of dissolution Ti and Nb, or Ta which fixed carbon, oxygen, and the nitrogen atom in working liquid by Ti, Nb, or Ta is contained. The high-corrosion-resistance surface treatment method which is the 5-500-micrometer-thick range, and is characterized by forming the electron discharge method alloy layer of either a ferrite phase or gamma phase of nickel content.
[Claim 7] In the case of the Ni group alloy with which said member contains Cr 15 to 23%, and contains 2.5 to 37%, and Mo for Fe 16% or less by weight in Claim 3 It is the range Cr and whose Ni concentration are 0.83 to 1.5 times each concentration of a base material by weight on the surface. And those compounds and 2% or less of dissolution Ti and Nb, or Ta which fixed carbon, oxygen, and the nitrogen atom in working liquid by Ti, Nb, or Ta is contained. The high-corrosion-resistance surface treatment method which is the 5-500-micrometer-thick range, and is characterized by forming the electron discharge method alloy layer of either gamma single phase or the mixed phase of gamma and gamma'.
[Claim 8] In Claim 3, when said member is carbon steel or low alloy steel, Cr concentration by weight on the surface 9% - 12%, Or Cr concentration is [17% - 19%, and Ni concentration] 13% or less of range. And the high-corrosion-resistance surface treatment method characterized by containing those compounds and 2% or less of dissolution Ti and Nb, or Ta which fixed carbon, oxygen, and the nitrogen atom in working liquid by Ti, Nb, or Ta, and forming the electron discharge method alloy layer of the 5-500-micrometer-thick range.
[Claim 9] (Iron Fe) radical alloys, such as carbon steel, low alloy steel, austenitic stainless steel, or ferritic stainless steel, [the surface of the structure which consists of said member which receives the structure in a light water reactor or neutron irradiation of the member which consists of a (Nickel nickel) radical alloy or a cobalt (Co) radical alloy] Electron discharge method processing is carried out in the inside of an oil, or underwater using a conductive ceramic electrode. The high-corrosion-resistance surface treatment method characterized by forming in the surface the electron discharge method alloy layer which consists of the amorphous layer which consists of the constituent element and electrode component element of said member, a fine crystalline layer, or a layer which ceramic particles distributed at the same time it removes the initial surface.
[Claim 10] The high-corrosion-resistance surface treatment method characterized by said member being the part which receives weld zones, such as neutron flux Measurement Division housing which is the structure in a light water reactor furnace, a shroud, shroud

support, a top guide, and the reactor core support plate surface, a heat affected zone, or neutron irradiation in Claim 9.

[Claim 11] The high-corrosion-resistance surface treatment method characterized by using the sialon (Sialon) or the silicon carbide (SiC) of titanium boride (TiB2) and titanium nitride (TiN) content as a conductive ceramic electrode in Claim 9 or 10.

[Claim 12] In either of the Claims 1-11, after forming an electron discharge method alloy layer by electron discharge method processing, energy, such as a laser beam, an electron beam, or a TIG arc, is irradiated. The high-corrosion-resistance surface treatment method characterized by carrying out rapid solidification and forming a remelting surface alloy layer after making some metals which are an electron discharge method alloy layer and a member for processed to be processed remelt.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the high-corrosion-resistance surface treatment method which starts the surface treatment processing technique of the sake on the corrosion resistance which makes a high-corrosion-resistance alloy layer form in the surface of the structure which receives the structure in a light water reactor, or neutron irradiation, and a stress-corrosion-cracking-proof disposition, especially contributes to the reinforcement of a light water reactor plant.

[0002]

[Description of the Prior Art] The vacuum evaporationo, the chemical vacuum deposition, physical vapor deposition, and ion implantation which a coating, plating as an electrochemical technique, etc. are utilized in ancient times as a corrosion prevention cure technique of a material-list side in which an environment receives corrosion breakage, and are performed in vacuum atmosphere in recent years are being applied conventionally. It is in these methods only mainly forming a corrosion-resistant metallic film in a material-list side, and it cannot be said that the meaning of forming the film which improves adhesion with an ingredient and corrosion resistance is enough. On the other hand, the method of carrying out surface treatment of the material-list side by an electron discharge method is proposed. For example, there are (I) JP,62-24916,A number, (II) JP,H2-83119,A, etc. Moreover, a material-list side is fused and techniques which made the heat source the TIG arc or laser beam which uses only the presentation of an ingredient, adjustment, or the surface section of an ingredient as high anticorrosion combination gold, such as a TIG arc process or the laser method, are being applied.

[0003]

[Problem to be solved by the invention] There are some technical problems in high anticorrosion-ization of the lowered material-list side of the material-list side which is under

corrosive environment or has a possibility that it may be exposed to this environment, and corrosion resistance. The problem of the existence of the optimal method for 1st giving the problem of washing-izing of a treating surface and the 2nd high corrosion resistance to the surface is mentioned. Washing-ization of the treating surface is performed using the technique in which the object differs from anticorrosion-ization, for example, machining, and chemical and an electrochemical technique. However, it sets to the surface treatment of the structure in a furnace of for example, the object part covered with corrosion resistance lowered surface or lowered corrosion product, and the light water reactor system. Since it is the severe conditions of the activity under a radiation environment, the technique of the ability to do simultaneously surface-washing-izing and the surface treatment technique as pretreatment of high anticorrosion-ized surface treatment is desired. Moreover, also in the usual surface treatment, it is unrelated in the shape of surface type, and the technique in which surface state adjustment processing and high anticorrosion-ized surface treatment processing can make simultaneous the surface which is not decontaminated has a large role over an industry top. There is the surface treatment method by an electron discharge method as a technique on which this technical problem is satisfied. It will progress, when the heat input over an electron discharge method is small, and a surface alloying process carries out the fusion evaporation of an electrode and the surface treatment work by minute discharge between an electrode and a surface treatment work and the congelation is fused by the surface treatment work surface with evaporation of working liquid. Although the surface is alloyed by many duplication discharge, since the effect on a non-processed region is small, the deer with small 1 time of discharge surface area and heat input is also excellent as the surface treatment method of an ingredient.

[0004] Although (I) of the column of conventional technology and (II) are proposed as the high anticorrosion-ized surface treatment method by this electron discharge method It says that the method indicated by (I) will form an amorphous layer or fine crystalline layers, such as silicon (Si), in the surface treatment work surface by an electron discharge method, and there is a problem which must arrange layers, such as Si, in a conductive copper surface as an electrode. Moreover, by the method indicated by (II) making Si powder contributed to oxidation-resistant surface treatment mix into electron discharge method liquid, and carrying out an electron discharge method It says that the amorphous layer or fine crystalline layer of silicon (Si) will be formed in the surface treatment work surface, and there is a problem which must perform special processing to electron discharge method liquid. Moreover, when it was going to apply the technique of the TIG arc process or the laser method independently, these surface-melting methods had the demerit which changes the physical properties of an ingredient around a surface treatment part, when it heated by a high heat input.

[0005] [sake / therefore, / on the corrosion resistance of the surface of the structure as for which the object of this invention receives the structure in a light water reactor, or neutron irradiation, and a stress-corrosion-cracking-proof disposition] The alloy or conductive

Ceramics Sub-Division containing corrosion resistance good elements or these elements is used as an electrode using electric spark forming, and it is in offering the high-corrosion-resistance surface treatment method which forms the electron discharge method alloy layer which has the surface state regulated treatment as pretreatment of the refining member surface, and high corrosion resistance.

[0006] Moreover, another object of this invention applies techniques, such as a TIG arc process or the laser method, for the electron discharge method alloy layer which formed the surface of the structure which receives the structure in a light water reactor, or neutron irradiation using electric spark forming further. It is in offering the high-corrosion-resistance surface treatment method which can form the remelting surface alloy layer which is excellent in corrosion resistance.

[0007]

[Means for solving problem] In order to attain the above-mentioned object, the following methods are used as a surface treatment approach by this invention. Namely, (Iron Fe) radical alloys, such as carbon steel, low alloy steel, austenitic stainless steel, or ferritic stainless steel, [the surface of the structure which receives the structure in a light water reactor or neutron irradiation which consists of a (Nickel nickel) radical alloy or a cobalt (Co) radical alloy] Using the electrode which has at least one high-corrosion-resistance element, in the inside of an oil, or underwater, electron discharge method processing is carried out and it is characterized by forming the electron discharge method alloy layer excellent in corrosion resistance in clearance on the surface of initial of said member, and this surface.

[0008] Moreover, (Iron Fe) radical alloys, such as carbon steel, low alloy steel, austenitic stainless steel, or ferritic stainless steel, [the surface of the structure which receives the structure in a light water reactor or neutron irradiation which consists of a (Nickel nickel) radical alloy or a cobalt (Co) radical alloy] Electron discharge method processing is carried out in the inside of an oil, or underwater using a conductive ceramic electrode. It is characterized by forming in the surface the electron discharge method alloy layer which consists of the amorphous layer which consists of the constituent element and electrode component element of the member for processed, a fine crystalline layer, or a layer which ceramic particles distributed at the same time it removes the initial surface.

[0009] In these surface treatment approach, after forming an electron discharge method alloy layer by electron discharge method processing, energy, such as a laser beam, an electron beam, or a TIG arc, is irradiated. After making some structures which receive the structure in a light water reactor or neutron irradiation which is an electron discharge method alloy layer and a member for processed remelt, it is characterized by carrying out rapid solidification and forming a remelting surface alloy layer.

[0010]

[Function] In this invention, electron discharge method processing is carried out between an electrode and the metal which is an ingredient to be processed, and an electron discharge method alloy layer is formed in a surface of metal to be processed. A surface alloying

process will carry out the fusion evaporation of an electrode and the surface of metal to be processed by minute discharge between an electrode and a metal to be processed, and when the congelation fuses to a surface of metal to be processed and is alloyed with evaporation of working liquid, it will progress. Although the surface is alloyed by many duplication discharge, since the effect on a non-processed region is small, the deer with a small heat input over one discharge surface area and an electron discharge method is also excellent as the surface treatment method of an ingredient.

[0011] If it is in this invention, the combination of an electrode and a metal to be processed is important. If what has a high-corrosion-resistance element as an electrode is used, a high corrosion resistance electron discharge method alloy layer will be formed in a surface of metal to be processed. Moreover, if conductive Ceramics Sub-Division is used as an electrode, the electron discharge method alloy layer which consists of the amorphous layer which becomes a surface of metal to be processed from a metaled constituent element and a metaled electrode component element, a fine crystalline layer, or a layer which ceramic particles distributed will be formed. As for the thickness of an electron discharge method alloy layer, 5-20 micrometers is desirable.

[0012] Thus, since rapid solidification is carried out and a remelting surface alloy layer is formed, after irradiating energy, such as a laser beam, an electron beam, or a TIG arc, to the formed electron discharge method alloy layer and making some of electron discharge method alloy layers and metals to be processed remelt Corrosion resistance and stress-corrosion-cracking-proof nature can be raised without changing the physical properties of an ingredient a lot around a surface treatment part.

[0013] [this invention] The weld zone containing the heat affected zone and the fusion coagulation section of the welded structure in a light water reactor which consist of the member and these alloy member of (Iron Fe) radical alloys, such as carbon steel, low alloy steel, ferritic stainless steel, or austenitic stainless steel, (Nickel nickel) radical alloy, or a cobalt (Co) radical alloy, Or chromium (Cr) which is a high-corrosion-resistance element about the surface of the structure in a furnace which has the part which receives neutron irradiation, Consist of any one or two components or more among nickel (nickel), titanium (Ti), niobium (Nb), and a tantalum (Ta).